

Observation of Serum Lipid Profile and hsCRP in Prediabetic Population.

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ABSTRACT

Background: Dyslipidemia and raised serum hsCRP level occurring in diabetic patients, play an important role in development of macrovascular and microvascular complications as compared to nondiabetics. Keeping in view the prevalence and increased risk of multiorgan involvement in diabetes, it is imperative to diagnose prediabetic individuals and assess their serum lipid profile and serum hsCRP level and Use of these biomarkers as a preventive measure from the complications of prediabetes, developing overt diabetes and increased morbidity and mortality. Aim: observation of serum lipid profile and hsCRP in prediabetic population. **Methods:** Prospective cross-sectional case control observational study carried out between August 2017- November 2018 (16 months) which included 100 cases (prediabetics) and 100 controls (nondiabetics). Lipid profile and serum hsCRP level of all prediabetic individuals and nondiabetics was done and statistically analyzed. **Results:** Serum Total cholesterol, triglyceride (TG), low density lipoprotein (LDL) and serum hsCRP level were significantly raised in prediabetic individuals as compared to nondiabetics, whereas high density lipoprotein (HDL) was nonsignificantly lower and mean with SD was much lower side in prediabetic individuals as compared to nondiabetics. **Conclusion:** Prediabetics had altered lipid profile as compared to nondiabetics. These prediabetic individuals, because of their raised hsCRP level and dyslipidemia, are at higher risk for developing cardiovascular disease and other multiorgan involvement. So to halt progression by primary prevention as Lifestyle modification or pharmacotherapy in such individuals becomes an important public health consideration.

Keywords: Prediabetes, Dyslipidemia, Diabetes mellitus, hsCRP (high sensitive C - reactive protein), HDL, LDL, TG, TC.

INTRODUCTION

Diabetes Mellitus is the major public concern worldwide. Its prevalence has risen dramatically over past two decades from 30 million to 382 million. In Indian population 61.3 million people had diabetes in 2011 which is expected to reach 101.2 million by 2030 [International diabetes federation]. Diabetes has become a global pandemic, generating overwhelming cost and burden upon patient as well as health care providers. Prevalence of type 2 DM is increasing due to obesity and prolonged life span and reduced activity. Maximum diabetic population live in low income to medium income countries and globally 50% of individuals may be undiagnosed. (ICMR-INDIAB study) Diabetes mellitus is a group of common metabolic disorder of phenotypic hyperglycemia and affect multiple organ systems that imposes a tremendous burden on health care system. It is the seventh leading cause of mortality.

If we diagnose the disease in prediabetic stage we could be able to prevent further progression to diabetes mellitus and its complications, reducing the morbidity, prevalence and burden on health care system.

Prediabetes is defined as impaired fasting glucose or impaired glucose tolerance according to WHO Criteria (WHO diagnosis & classification of diabetes mellitus)

Impaired Fasting glucose (IFG)-Fasting Plasma glucose level 110-125 mg/dl OR/AND Impaired glucose tolerance (IGT)- Plasma glucose level 140-199 mg/dl 2 hours after ingesting 75 g of glucose.

In the present study WHO criteria of prediabetes have been taken. According to National diabetes fact sheet 2011, in United States 79 million people were in prediabetes phase.

The American diabetes association reports that approximately 11% of people with prediabetes who receive no treatment or intervention will develop type 2 diabetes every year.

Diabetes mellitus is multifactorial and common risk factors include being overweight especially those who have excess weight around waistline, physically inactive, dyslipidemia (high triglyceride and low high density lipid or high total cholesterol), high

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blood pressure, polycystic ovarian disease, gestational diabetes, family history of diabetes or heart disease.

Pre diabetes occurs 73.4% more frequently in people with family history of diabetes as compared to those without family history and are at higher risk of developing diabetes mellitus and its complications.

Besides raised blood sugar, inflammation also plays a significant role in pathogenesis of diabetes and atherosclerosis. Markers of inflammation like hsCRP are significantly raised in diabetes mellitus.

In some studies, it has been observed that in Prediabetes there may be rise in hsCRP level or altered lipid profile.

Further studies are needed to identify the abnormality in hsCRP and changes in the level of sub fraction of serum lipids in prediabetes and to establish any correlation between them.

The present study has been planned to study the serum lipid profile alterations and hsCRP in Prediabetic patients.

MATERIALS AND METHODS

The study was performed after ethical approval on the consenting patients attending medical outdoor and indoor of Patna Medical College and Hospital, Bihar who fulfilled criteria for prediabetes as defined by WHO unless meeting exclusion criteria. Detailed history and examinations has been done.

One hundred patients who are fulfilling the criteria of prediabetes according to WHO will be included in this study. About 100 age and sex matched persons with similar comorbid conditions and normal blood sugars level will be selected as control. Both groups will undergo measurements of serum lipid profile

(total cholesterol, HDL, LDL, Triglycerides) & quantitative value of hsCRP.

Inclusion Criteria

The patients attending medical outdoor or indoor who are fulfilling the criteria for prediabetes as defined by WHO will be included in this study.

Exclusion Criteria

Chronic Kidney Disease, diabetic patients, Stroke, Coronary Artery Disease ,primary hypercholesterolemia, Patients taking OHA or Insulin, Active infection or septicemia ,Pregnancy & Smoking

Study Design

Prospective case control observation study.

Sample size

Prediabetic group 100 (case) and nondiabetic group (100) control.

Duration of study

16 months (august 2017- November 2018)

Statistical Analysis

Statistical analysis was done by using descriptive statistics and inferential statistics, using chi-square test, odd's ratio, Pearson's correlation coefficient, and multiple regression analysis. The software used in this analysis were SPSS version 17.0 and Graph Pad Prism version 5.0. A p value <0.05 was considered as a level of significance.

RESULTS

The overall presence of altered serum total cholesterol, LDL, triglycerides, HDL and raised hsCRP with statistical significance is given in [Table 2].

Table 1A: NCEP (National Cholesterol Education Programme) ATP III Classification of Lipid profile.

Risk	LDLc	HDLc	triglycerides	cholesterol
High/low	≥160	<40	≥200	≥240
borderline	130-159	40-59	150-199	200-239
desirable	100-129	>60	150	<200
optimal	<100	-	-	-

Table 1B: Serum hsCRP level (Normal result CRP MedlinePlus; April 2015).

Risk	HsCRP
Normal	<1 mg/L
Above optimal	1-3 mg/L
Raised	>3 mg/L

Table 2: Biochemical markers in nondiabetics and prediabetics.

Variables	Nondiabetics (n=100)(Mean ± SD)	Prediabetics (n=100) (Mean ± SD)	P-value	χ ² value	significance
FPG	89.21±6.73	118.52±4.23	-	-	-
2h PG	127.85±7.80	163.85±16.07	-	-	-
TC (mg/dl)	184.42±24.81	199.07±25.36	0.037	6.589	Significant
TG (mg/dl)	143.30±23.34	161.31±20.85	0.046	3.956	Significant
HDL (mg/dl)	50.23±7.56	45.60±8.09	0.194	3.283	Nonsignificant
LDL (mg/dl)	105.50±26.50	120.77±24.56	0.038	8.428	Significant
HsCRP (mg/l)	1.47±1.12	2.51±1.65	0.036	6.651	Significant

DISCUSSION

Patients were evaluated for serum total cholesterol (TC) according to [Table 1A], raised cholesterol was found in 41% in study group (199.07 ± 25.36 mg/dl) as compared to 24% in control group (184.42 ± 24.81 mg/dl). The finding was statistically significant at $p=0.037$.

In comparison to previous study Kansal S., Kamble TK et al,^[1] on "Lipid Profile in Prediabetes" shown that raised cholesterol was present in mean value of total cholesterol for cases (184.75 ± 46.02 mg/dl) was more than controls (170.99 ± 38.27 mg/dl). P-value was 0.020 ($p<0.05$) i.e. significant.

Patients were evaluated for serum triglycerides (TG) level according to [Table 1A], raised triglycerides was found in 52% in study group (161.31 ± 20.85 mg/dl) as compared to 38% in control group (143.30 ± 23.34 mg/dl). The finding was statistically significant at p value of 0.046.

In comparison to previous study Kansal S, Kamble TK et al,^[1] on "Lipid Profile in Prediabetes" shown that raised Mean value of triglyceride for case (139.5 ± 47.24 mg/dl) was higher than controls (106.81 ± 61.97 mg/dl). P-value was 0.0002 ($p<0.05$) i.e. significant.

Similarly, Rahbar et al^[18] showed that pre-diabetics are at higher risk of having high triglyceride(TG).

Patients were evaluated for serum Low Density Lipid(LDL) level according to Table-1A, raised LDL level was found in 32% in study group(120.77 ± 24.56 mg/dl) as compared to 19% in control group (105.50 ± 26.50 mg/dl). The finding was statistically significant at p value of 0.038.

In comparison to previous study Kansal S, Kamble TK et al^[1] on "Lipid Profile in Prediabetes" shown that raised cholesterol was present in mean value of serum LDL for cases (120.39 ± 38.34 mg/dl) was more than controls (98.84 ± 29.57 mg/dl). P-value was 0.001 ($p<0.05$) i.e. significant.

Magge et al^[16] observed that obese Prediabetic adolescent have significantly more atherogenic lipid profile than obese non diabetic group.

Rahbar et al^[18] reported that Prediabetics are at higher risk of having increased level of serum LDL level as compared to nondiabetics.

Patients were evaluated for serum High Density Lipid level (HDL) according to Table-1A, decreased HDL level was found in 17% in study group (45.60 ± 8.09 mg/dl) as compared to 09% in control group (50.23 ± 7.56 mg/dl). The finding was statistically as p value of 0.194 i.e. nonsignificant but the mean is lower side in prediabetes group.

Study by Singh K, Srivastava N et al^[3] shown that serum HDL level is non significantly raised in Prediabetic as compared to nondiabetic with p value of 0.92 i.e. nonsignificant.

Patients were evaluated for serum hsCRP level according to Table-1B, raised (>3 mg/dl) hsCRP level was found in 27% in study group

(2.51 ± 1.65 mg/l) as compared to 16% in control group (1.47 ± 1.12 mg/l). The finding was statistically significant as p value of 0.036.

In previous study Ravish H, M Kumar R et al^[8] observed that hsCRP is significantly raised in Prediabetic group (4.77 ± 3.95) as compared to nondiabetic group (2.35 ± 2.64) having p value of 0.007 i.e. significant.

Prediabetes group were also evaluated for the correlation between raised serum hsCRP level and altered lipid profile, was found in 25% in Prediabetic group have both raised hsCRP level and dyslipidemia and p value is 0.02 i.e. significant.

In Waheed P., Naveed AK and Farooq F. et al^[15] "Levels of Inflammatory Markers and their Correlation with Dyslipidemia in Diabetics" proved the positive correlation between dyslipidemia and diabetes.

But further study is required to established the correlation between raised hsCRP and dyslipidemia in prediabetic population.

CONCLUSION

In this study serum Total cholesterol, LDL, Triglycerides, and hsCRP level (marker of inflammation) were significantly raised in prediabetic individuals as compared to nondiabetic subjects whereas HDL was nonsignificantly lower in Prediabetic individuals as compared to nondiabetic subjects. These prediabetic individuals because of their raised hsCRP level and dyslipidemia, are at higher risk for developing cardiovascular disease. Lifestyle modification or pharmacotherapy in Prediabetics becomes an important consideration. Relationship between serum HDL level and prediabetes is found nonsignificant in my study but mean and SD is more towards lower side and may be due to small population size.

So with some limitation of this study like small population size and factors which increases the risk of raised hsCRP level and dyslipidemia like race, BMI, genetic factor should be taken into consideration.

By identifying prediabetic patients who actually are at risk, can prevent their progression to diabetes and its complications by treating them at early stages.

On the basis of this study I recommend proper screening for diagnosis of prediabetes and associated dyslipidemia, hsCRP and introduce a healthy lifestyle or pharmacotherapy for those prediabetic individuals to decrease the risk of cardiovascular disease.

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